

STEPHEN AUSMUS (K11427-2)



With a GPS unit strapped to his all-terrain vehicle, agricultural engineer Roger Eigenberg tows a sled with an electromagnetic geoconductivity meter attached to measure soil conductivity.

Manure contains nutrients, such as nitrogen, that spur growth in field crops. But excess nutrients can be harmful if they end up in surface or subsurface waters. Agricultural Research Service (ARS) agricultural engineer Roger A. Eigenberg is pinpointing where the nutrients end up after being placed on a field.

In Clay Center, Nebraska, at the Roman L. Hruska U.S. Meat Animal Research Center, Eigenberg studies nutrient movement in several fields by use of electromagnetic induction (EI). He uses various instruments to do this, including one that looks

Measuring Nutrient Buildup With Electromagnetic Induction

like an oversized sled, which is pulled by an all-terrain vehicle or a human when the crop is too tall.

Using the EI information, a computer makes a multishaded map, with light-shaded areas representing high electrical conductivity—or areas of high nutrient concentration—and dark areas low conductivity, or low nutrient concentration.

Since 1999, Eigenberg has monitored nutrient movement on a cornfield in Clay Center. The field was divided into sections that either had or did not have winter cover crops and that were treated with

manure, compost, or commercial fertilizer. He took weekly measurements to shed light on changing conditions in the top 6 to 8 inches of soil.

“Soil conductivity changes greatly throughout the growing cycle,” Eigenberg says. “From crop emergence to 1 foot tall, there is a gradual increase in soil conductivity and nitrate content on this cornfield. But after this, there is a rapid decline of conductivity, indicating that the corn is rapidly taking up the nutrients. Once the crop is harvested, there is another gradual increase in conductivity.”

The cover-crop region shows lower conductivity early until midway into the growing season when cover and no-cover conductivity values converge. Fields with cover crops retain some nutrients through the winter and give them to the main crop in the spring.

From 1996 to 1999, Eigenberg studied a second site that was used to process feedlot manure into compost in the early 1990s. The old way of locating where compost rows had once been was to take many soil samples, but with EI, similar results are faster and easier. “The maps we make clearly show patterns of high conductivity—and thus high levels of nutrients—where the rows of manure had been,” Eigenberg says.

Eigenberg conducted EI and soil tests periodically and saw that the nutrients leached deeper into the soil every year. He hopes EI maps will show farmers which areas of their fields may lead to leaching because of high nitrate concentration. It’s an effective management tool to see where nutrients are and whether they are moving in a field. It can also be used to help farmers decide where and how much manure should be applied.—By **David Elstein**, ARS.

This research is part of Manure and Byproduct Utilization, an ARS National Program (#206) described on the World Wide Web at www.nps.ars.usda.gov.

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